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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/082,009 | 02/20/2002 | Tsu Shih | 67,200-646 | 1899 |

7590 03/09/2005

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EXAMINER

MARKOFF, ALEXANDER

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1746

DATE MAILED: 03/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/082,009

Applicant(s)

SHIH ET AL.

Examiner

Alexander Markoff

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,5-10 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,5-10 and 16-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/20/04 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1, 3, 5-10 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Edelstein et al (any of US Patents 6,251,787 and 6,153,043) in view of Obeng et al (US Patent No 6,323,131), Zhang et al (US Patent No 6,162,301), Kneer (US Patent No 6,147,002) and the state of the art admitted by the applicants in the specification (pages 6-7, especially paragraph 009).

Edelstein et al teach a method for elimination of photo-induced corrosion and dissolution of exposed copper in CMP and post-CMP processing by shielding the processing from the light. The document disclosed shielding the light in CMP, brush cleaning, rinsing, etc. The document discloses blocking the claimed wavelength with the sufficient specificity by disclosure the range less than about 900 nm, it means that all the claimed light, which has wavelengths inside of the disclosed range, is blocked. The document teaches that the method works in presence of electrolytes.

See entire documents, especially, Abstract and Description of the Preferred Embodiments.

Thus, Edelstein et al teach a method as claimed except for specific recitation of the acidic cleaning solution and the specific pH of the solution.

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The secondary references and the admitted art all teach that conventional cleaning solutions used in conventional steps of post-CMP cleaning of structures with exposed copper are acidic and have the claimed pH. The documents disclose the use of these solutions in immersing, rinsing, brush cleaning, etc., i.e. in the steps disclosed by Edelstein et al.

It would have been obvious to an ordinary artisan at the time the invention was made to apply the method of Edelstein et al on the processes of post-CMP cleaning, which utilized conventional cleaning solutions disclosed by Obeng et al, Zhang et al, Kneer and the admitted prior art with reasonable expectation of success in order to prevent etching, dissolution and corrosion of the exposed copper surfaces.

As to the the presence of copper oxide: The applicants themselves admitted in the specification (paragraph 009) that CMP process leaves oxide contamination and that an acidic post-CMP cleaning solution is conventionally used to remove it. It would have been obvious to an ordinary skill in the art that at least some amount of oxide would be presented on the cooper surface after conventional CMP process and thereby during the post-CMP cleaning of the modified Obeng et al, Zhang et al, Kneer and the admitted prior.

Response to Amendment

6. Applicant's arguments filed 12/20/04 have been fully considered but they are not persuasive.

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The applicants argue that the rejection made under 35 USC 103 is not proper because Edelstein et al do not specifically recite removal of copper oxide and interconnects.

This is not persuasive because the document, in contrast to the applicants' statement, specifically recites copper interconnects and is directed to the same problem as the instant application. See at least, column 1, lines 27-63; column 6, lines 34-57. The fact that a different term is used in most parts of the document, does not change the fact that the prior art concern the same problem and solves the referenced problem by the same means as the instant invention.

The instant invention and the cited prior art document are both concerned about the same damascene, CMP and post-CMP processing of the wafers, the same specific problem – corrosion of copper surfaces during this processing. The instant invention and the cited prior document art are both proposed the same solution to prevent such corrosion.

The secondary references are cited to show that the claimed solutions were conventional for post-CMP processing.

As to the argument that the prior art is silent regarding the presence of copper oxide: The applicants themselves admitted in the specification (paragraph 009) that CMP process leaves oxide contamination and that an acidic post-CMP cleaning solution is conventionally used to remove it. It would have been obvious to an ordinary skill in the art that at least some amount of oxide would be presented on the copper surface after conventional CMP process. This teaching was incorporated in the rejection.

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It is further noted, that the applicants themselves state that it was known that such solution would cause erosion of the cooper surfaces. Edellstein et al address exactly the same problem – erosion of cooper surfaces in post-CMP cleaning.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Markoff whose telephone number is 571-272-1304. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alexander Markoff
Primary Examiner
Art Unit 1746

AM

**ALEXANDER MARKOFF
PRIMARY EXAMINER**